

this singular mixture, but with so bad a result that from that time (nearly four years ago) the mere recollection of the experiment produces again not only the indescribably nasty taste of the *chimú*, but sometimes even the vomiting, which was the end of my first and only attempt to use this luxury of the *Merideños*. And for this very same reason I hasten to put an end to this note.

A. ERNST

Caracas, March 18

Anchor-Ice

THE formation of anchor-ice has attracted a good deal of attention in Upper Canada, although I am not aware of any efforts having been made to describe theoretically the cause of its formation. Prof. H. V. Hind, some time of Toronto, alludes to it in a paper read before the Geological Society (*Proc. Geol. Soc.*, xxi. p. 128), and I believe the late Sir Wm. Logan, director of the Canadian Geological Survey, also brought the matter before the same Society, though I cannot trace up the paper, and Mr. Keefer, C.E., of Ottawa, read a paper on this subject before the Canadian Institute (*Canadian Journal* (new series), vii., p. 173, 1862).

The conditions under which anchor-ice forms appear to be those mentioned by Dr. Rae, as far as my own observation goes, and Prof. Hind remarks, in the paper alluded to, that it is not uncommon for the seat-nets off the Labrador coasts to be frozen, in water as deep as 60 feet, and that the andhows of these nets frequently bring up masses of frozen sand. The most interesting question in connection with this subject seems to me to be, Does the ice form, from the precipitation of the very minute ice-particles, in passing over the rapids, or does the intense cold of the ground favour the formation of *raze*, as it is locally called, independently of the floating ice-particles passing over the stones? I have never known it to form on clay or alluvial bottoms.

There is another form of anchor-ice to be found in the great northern lakes, which floats in large sheets at a considerable depth under the surface of the water. During the construction of a large breakwater on the Georgian Bay I had a great deal of trouble from large floes of this ice, which seemed to be floating in layers at various depths in water 14 feet deep. The local opinion was that this ice was formed on the extensive rocky shoals which abound on that coast, and more particularly in the neighbourhood of the work on which I was engaged, and that the floes became detached by storms and the hammering of the surface-ice upon them. Whatever may have been the cause of their formation, they were very destructive in their force upon the timber caissons which were being sunk.

Edinburgh, April 22

ALAN MACDOUGALL

THE SONGS OF BIRDS.—D. W., of Freiburg im Breisgau, writes that Mr. C. C. Starling (*NATURE*, vol. xxi. p. 590) will find an elaborate paper, "Ueber Vogelstimmen, &c." (especially on their musical properties, with many notes), by Prof. Oppel, of Frankfurt-on-Main, in the monthly journal *Der zoologische Garten*, February, 1871 (vol. xii. No. 2), published by the Zoologische Gesellschaft of that place.

GEOLOGICAL SURVEY OF THE UNITED STATES

IT is now about a year since the Congress of the United States took seriously in hand the question of the national scientific surveys and made a complete reorganisation of them, consolidating the geological work into one general Geological Survey of the United States, under Mr. Clarence King as director. Some time had necessarily to elapse before much fruit could be seen from the new tree. It was especially needful in the first place to justify the large expenditure of money required for the organisation, by showing that not merely pure science, but the industrial and commercial interests of the country were materially aided by the Survey. Consequently while ordinary geological surveying has not been neglected, the chief strength of the staff has been expended upon economic geology, and more especially on the deposits of iron, lead, silver, and gold. Some of the great mining districts of the West have been very carefully explored,

and the results will be embodied in the Annual Report. It is understood that Mr. King's general plan is to arrange his forces in two divisions, one charged with the investigation of the economic geology, the other with general geology or the geological map. The second division will no doubt be mainly engaged in the Western States and Territories, which will be parcelled out into large districts each under a special officer. Thus there will probably be a corps placed on the Pacific slope, another on the Great Basin, a third on the Plateau country, and a fourth in the eastern mountain ranges, or Rocky Mountains proper. But besides this general distribution of the staff there is an intention, we believe, to devote attention to special problems further east, and, in a most liberal and thoroughly scientific spirit, to employ for their study the best geologists who can be found in these regions to undertake the duty.

Rumours of this last branch of Mr. King's scheme have been rife for some months past in the Eastern States; and, like most rumours, they have doubtless exaggerated the true state of the case. In a recent number of *NATURE* (vol. xxi. p. 197) attention was directed to his alleged proposal to extend the operations of his staff not only over the Western Territories and other parts of the public domain, but also over the Eastern and long-settled States. In spite of the serious and emphatic protest made by Prof. Dana against this proposal, we spoke of the proposal itself as a kind of joke, meant chiefly to flutter the geologists of the East, but with no serious thought of claiming in any way jurisdiction in the Eastern States. It appears, however, that the Director, in answer to official inquiries, has written a letter, which has been laid before the Senate by the Chairman of the Committee on Appropriations, to be printed in connection with a joint resolution authorising the extension of the Survey. In this letter he states that the Survey as at present constituted, being understood to be limited in its application to the national domain or public lands, cannot possibly present a general exposition of the mineral resources of the whole country, and that in spite of its labours for their enlightenment, "the people of the United States must remain ignorant of the extent, nature, and broad practical relations of their mineral possessions." He therefore insists on receiving from Congress authority "to work over the whole United States and to study its whole economical geology," summing up his arguments by declaring that "briefly and finally, in my belief, the question of the passage or defeat of the resolution under consideration is the question whether it is or is not desirable and needful for the people of the United States to thoroughly know the nature, extent, and uses of their mineral possessions."

In Mr. King's view the work of his Survey should be to collect statistics of the annual output of minerals, to publish a yearly volume giving full information of the progress of the mineral industries, "to actually and directly aid in their development," "to promote the wise and guarded influx of foreign capital," and generally to study the mineral wealth of the country in its extent, in the relations of one kind of deposit to another, and in the relations of all the deposits to industrial and commercial progress.

Mr. King no doubt knows intimately the temper of Congress, and understands precisely the tactics to be pursued to get from that body an appropriation of \$340,000. He is aware that he will be much more likely to gain his end by showing that he can augment the number of dollars in the national exchequer than by trying to persuade the legislature to believe in the importance of discovering the southern limits of the Northern Drift. He must be allowed to be a better judge of how to get a large vote from Congress than any quiet on-looker here can pretend to be. Yet even from his own point of view there are some aspects of his letter to which, with all deference to his well-known tact and

great experience, objection may be taken. There surely was no necessity for the introduction of such statements as that the value of a mineral in one State might be dependent on a single chemical fact or deposit in a remote State; that a New Jersey iron-founder may have to mix ore from Virginia with ore from Michigan, and procure his fuel from Pennsylvania and his fire-brick from Connecticut; and that gold-seekers in Georgia would lack a personal knowledge of California. Does Mr. King suppose that the mining industry of his country will stand still until it is instructed by the Geological Survey? The mining owners and speculators are quite alive to everything likely to be for their interest, and may be safely trusted to look after themselves. "The iron-corps of Wisconsin," he says, "could never safely judge of a Pennsylvania ore, which was required to be mixed with the Wisconsin product, unless the two were investigated together and their direct relations studied." But the Wisconsin corps could perfectly decide as to the amount of metal in the ore and the extent and workability of the deposit. The geological relations are unquestionably most interesting and important, but ignorance of them is happily not fatal to a very thriving industry.

The Director, it seems to us, does himself and his associates injustice in taking far too low a stand on which to urge the importance of a truly national Survey. In dealing with a popular assembly it is of course necessary to show that a service for which large grants are demanded has a real practical utility. But it is possible to carry this principle too far, and thereby to defeat its object. An acute Congressman might rise and object to such large appropriations being granted for what appeared to be mainly a work of statistics. "Mr. King's letter," he might argue, "puts great stress on the collection of accurate statistics of our mineral wealth. But we don't need a corps of trained geologists with good salaries to scour the country, finding out how many tons of coal are raised here and how many ounces of gold have been crushed there. I can undertake to do all this at a fiftieth part of the cost. All I ask is a couple of clerks and a free postage allowance. I would send a printed form to every mine-owner and district agent in the country, with columns in which to enter all the industrial particulars needed. And I would guarantee to lay before Congress as full and accurate a statement of our mineral output as Mr. King could do with his corps of geologists. Of course if Mr. King is going to make a scientific survey that is another matter. Let him set his corps to work on it, getting the most highly trained men he can find for the purpose. But it would be a waste of brain-power as well as of public money to employ scientific men to do mere clerks' work. Let us have under the Department of the Interior an office for mineral statistics, and leave the Geological Survey free to do proper geological investigation."

There is another part of Mr. King's letter which to an impartial spectator of the discussion cannot but appear ominous of possible evil. He states that it will be among the duties of his Survey "to actually and directly aid in the development of the mineral industry, and promote the wise and guarded influx of foreign capital." Our irrepressible Congressman would no doubt exhaust his eloquence on this topic. "What!" he might exclaim, "are the geologists of the Survey not only to collect statistics, but to be a kind of superior share-brokers and mining speculators? I wonder how much time they are likely to find for really geological work. I hope that they are men far above the love of filthy lucre, anxious only for their country's good, incapable of taking a fee, utterly unbribeable. Certainly their virtue will be put to the proof. A mining company stamped with the approval of the Geological Survey will no doubt be more easily floated into the market. On the other hand, a company whose claim is condemned as worthless by the

official authorities need not expect its shares to rise in value. Such approval or condemnation will no doubt be naturally regarded by mining men as a purchasable commodity. Even should every member of the Survey keep himself wholly apart from transactions of this kind, it is a misfortune that he should ever be exposed to temptation and to the suspicion which the public knowledge of that temptation so often and so unjustly arouses." No one who knows anything of Mr. King and his associates will for a moment entertain such suspicions, but may resent the mere mention of them. Nevertheless the Survey would do wisely to avoid having anything to do with capital either foreign or domestic. It cannot too jealously guard its scientific reputation. So long as its labours are strictly geological it will be regarded with respect as an impartial tribunal. The moment it begins to meddle with the monetary aspects of mining it will occupy a lower place in public estimation. What is more, it will make enemies. Disappointed speculators will find ample opportunity of revenge; and Mr. King may have a yearly struggle to get his appropriation.

With the most cordial interest in the welfare of the newly-organised Survey and every desire to see it enter upon a long, brilliant, and useful career, we would earnestly urge upon the authorities the desirability, nay, even the necessity, of concentrating as large a part of the force as possible upon the unsurveyed and only partially explored western regions. While this great work is in progress Mr. King will doubtless find ample opportunity of keeping before Congress and the public the industrial aspects of the Survey, and of showing that, even in a pecuniary point of view, the annual expenditure of money is well bestowed. He may be able to make use of the active geological talent of the Eastern States to aid him in collating geological sections and in working out special problems of general interest and importance. In the midst of these labours we do most sincerely trust he will see his way towards collecting material for a first general geological map of the United States. Nothing worthy of the name yet exists, and though many years must elapse before a detailed and accurate map can be issued, a very great boon would meanwhile be conferred, not only on geologists, but on the general public, by the preparation of a map (such as that published by the Lands Office) giving in condensed form the general results of geological investigation all over the Republic. ARCH. GEIKIE

STONE ARROW HEADS

MANY surmises have been offered as to how our prehistoric ancestors could have manufactured stone arrow heads before the uses of bronze or iron were known. Sir John Lubbock, Mr. John Evans, and other writers have suggested that the observations of travellers as to the mode pursued by savage nations in similar work might possibly lead to some correct conclusions. Acting on this hint Mr. B. B. Redding had published an account of the manufacture as practised by the Cloud River Indians. Prior to the close of the Modoc war the Wintoons or Cloud River Indians were without firearms. Up to that time the few settlers who resided about the base of Mount Shasta made it a rule to permit no Wintoon to carry a gun. As there are no agricultural lands and no mines on the Cloud River the Wintoons were left in almost undisputed possession of their prolific hunting-grounds and to the inexhaustible supplies of salmon and trout with which that river abounds. They had but little contact with the Americans until a station was established on their river by the United States Government for the taking of salmon eggs for distribution. Even to this day very few of them have guns, and their principal reliance in the chase is upon their primitive but powerful bow and arrows with stone heads. The stone arrow head maker is still a man of great importance in the tribe, and one of